Universidad Popular del Cesar

Minería de datos y Patrones

Version 2024-I

Genuine Impostor

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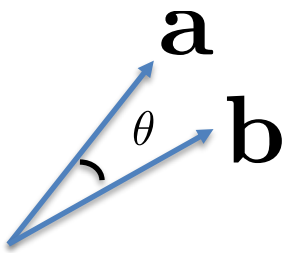
Face Verification Schema

Image A

Image B

Feature Extraction → $\frac{\mathbf{x}}{||\mathbf{x}||}$ → $\mathbf{a}$

Feature Extraction → $\frac{\mathbf{x}}{||\mathbf{x}||}$ → $\mathbf{b}$



$$s = \cos(\theta)$$

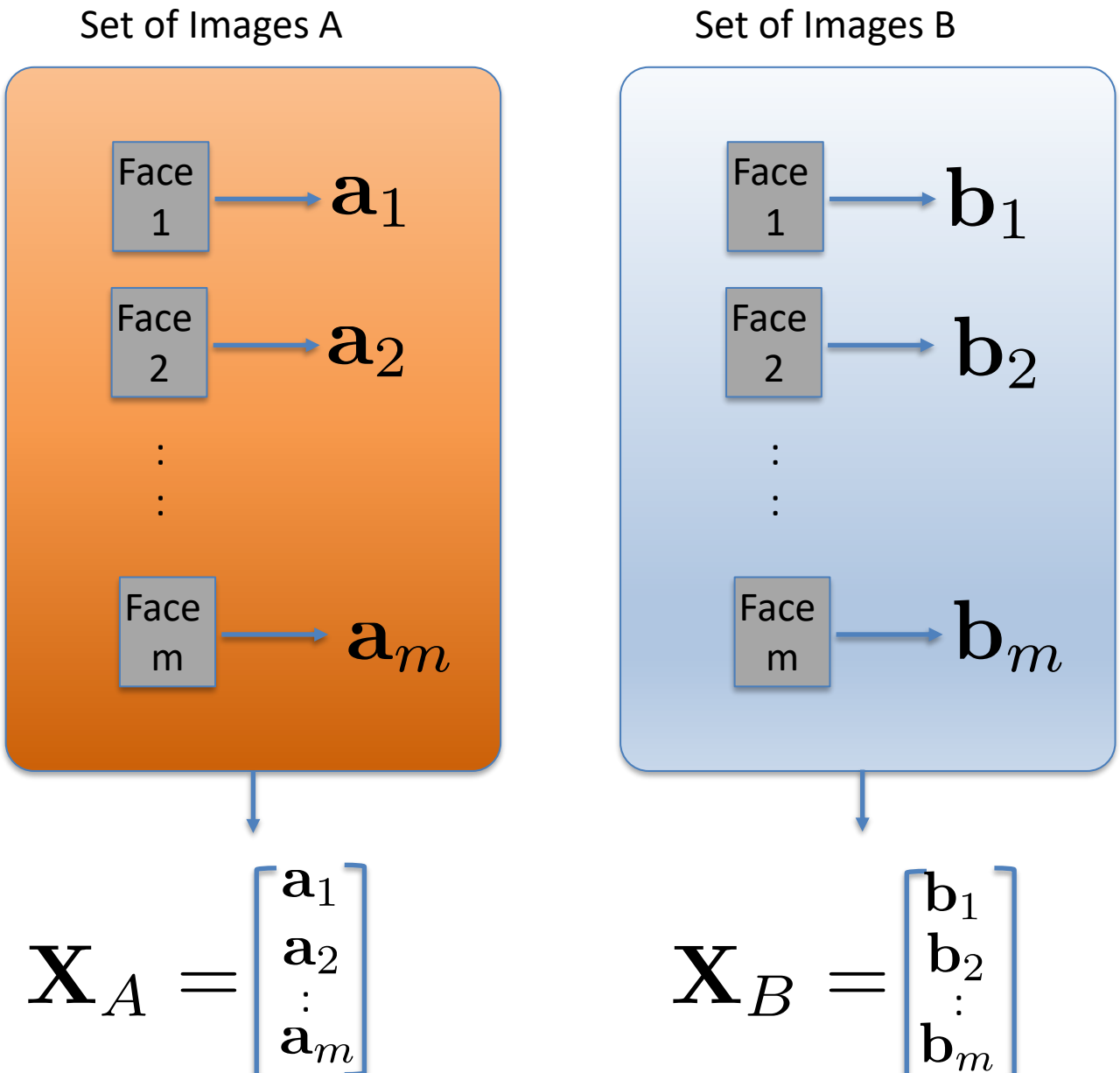
Vectors of n elements (1 x n)

Similarity using cos - similarity

$$s = \mathbf{a}\mathbf{b}^{\mathsf{T}}$$

If image-A and image-B are from the same person score s is high

If image-A and image-B are from different persons score s is low

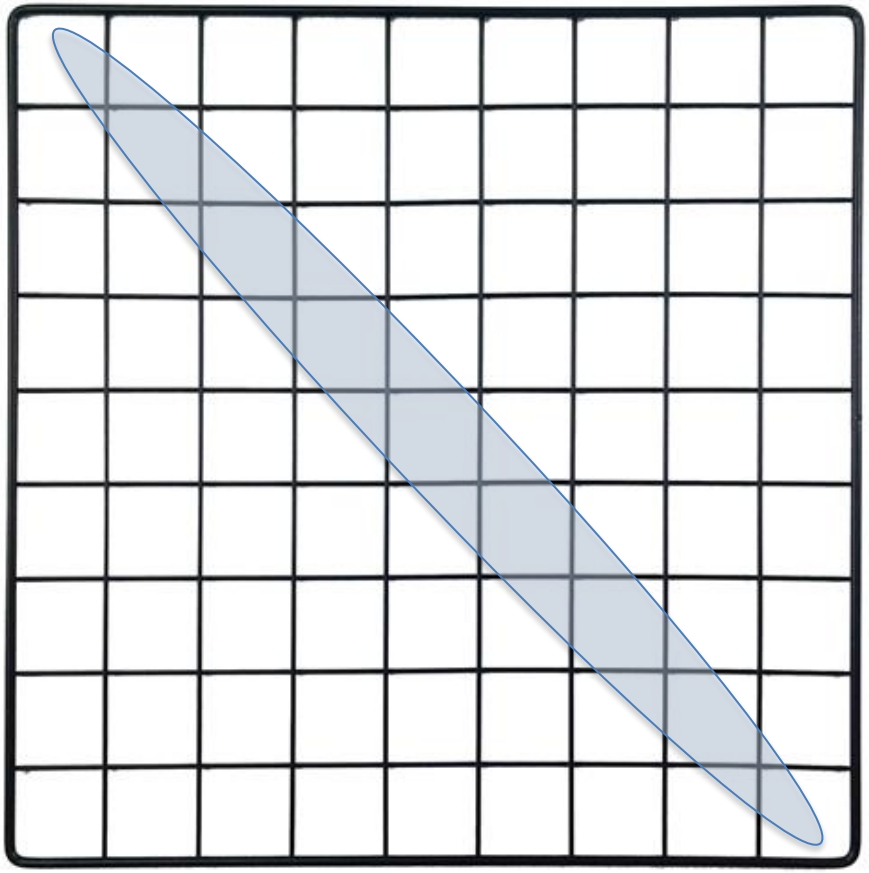


Face i of set A and Face i of Set B are from the same person.

Face i of set A and Face j of set B for $i \neq j$ are from different persons.

$$\mathbf{S} = \mathbf{X}_A \mathbf{X}_B^{\mathsf{T}} =$$

m x m elements



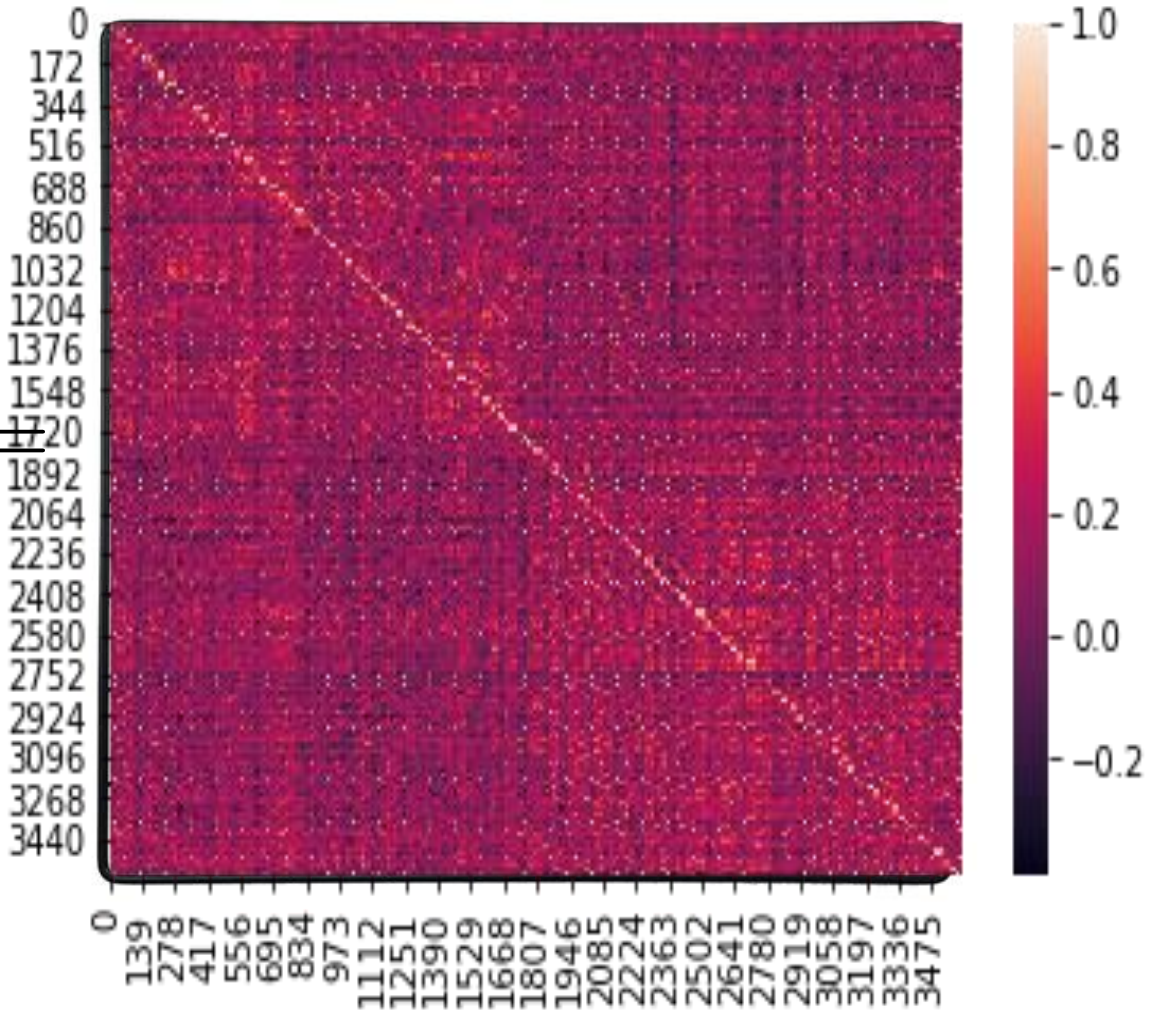
$s_{i,j} =$ Similarity between Face-i of set A and Face-j of set B

d^+: Diagonal : positive pairs (genuines)

d^-: Non-Diagonal: negative pairs (impostors)

$$\mathbf{S} = \mathbf{X}_A \mathbf{X}_B^{\mathsf{T}} =$$

m x m elements



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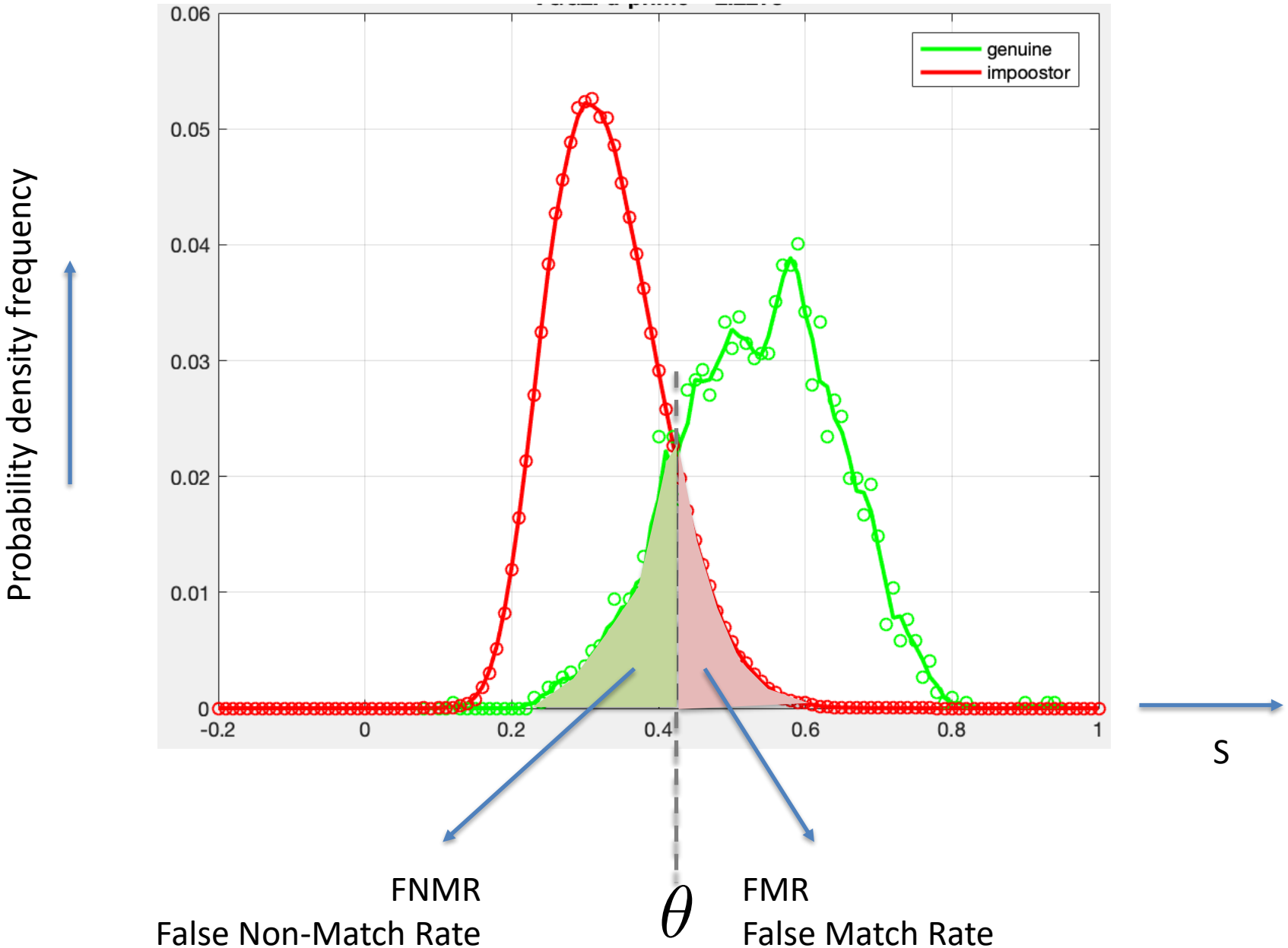
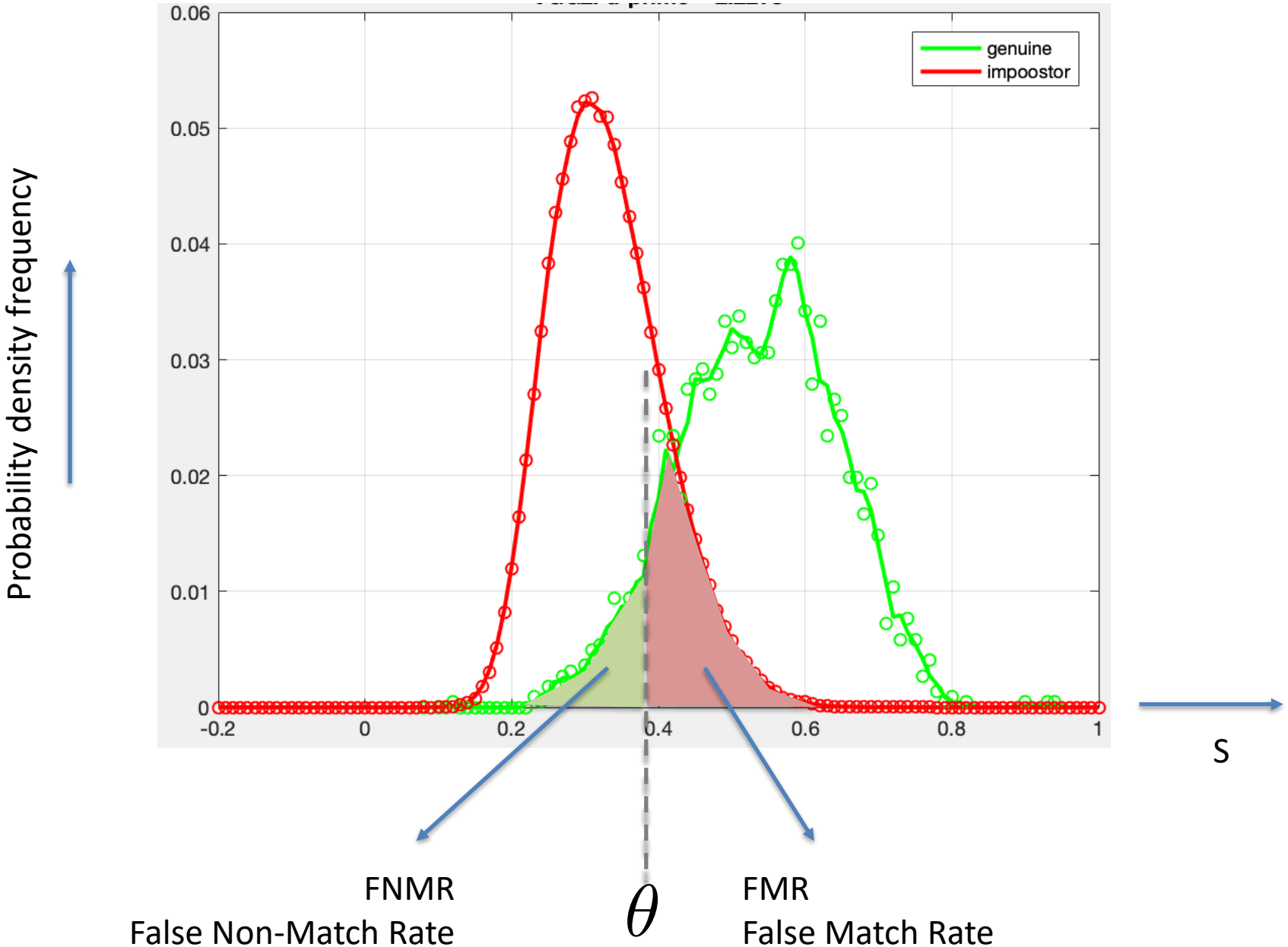

Probability density frequency
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.2
0
0.2
0.4
0.6
0.8
1
genuine
impoostor
S
FNMR
False Non-Match Rate
θ
FMR
False Match Rate


Probability density frequency
0.06
0.05
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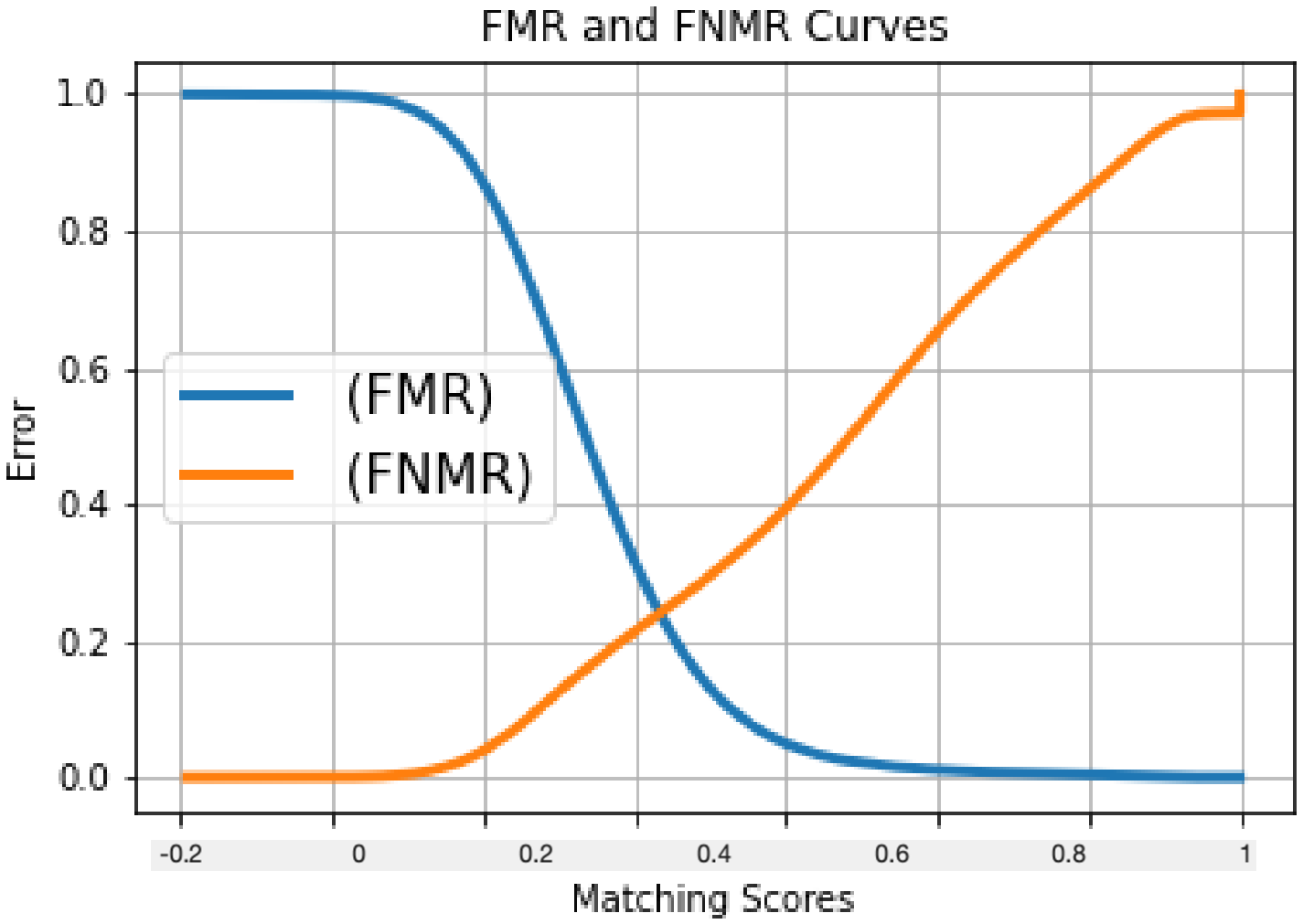
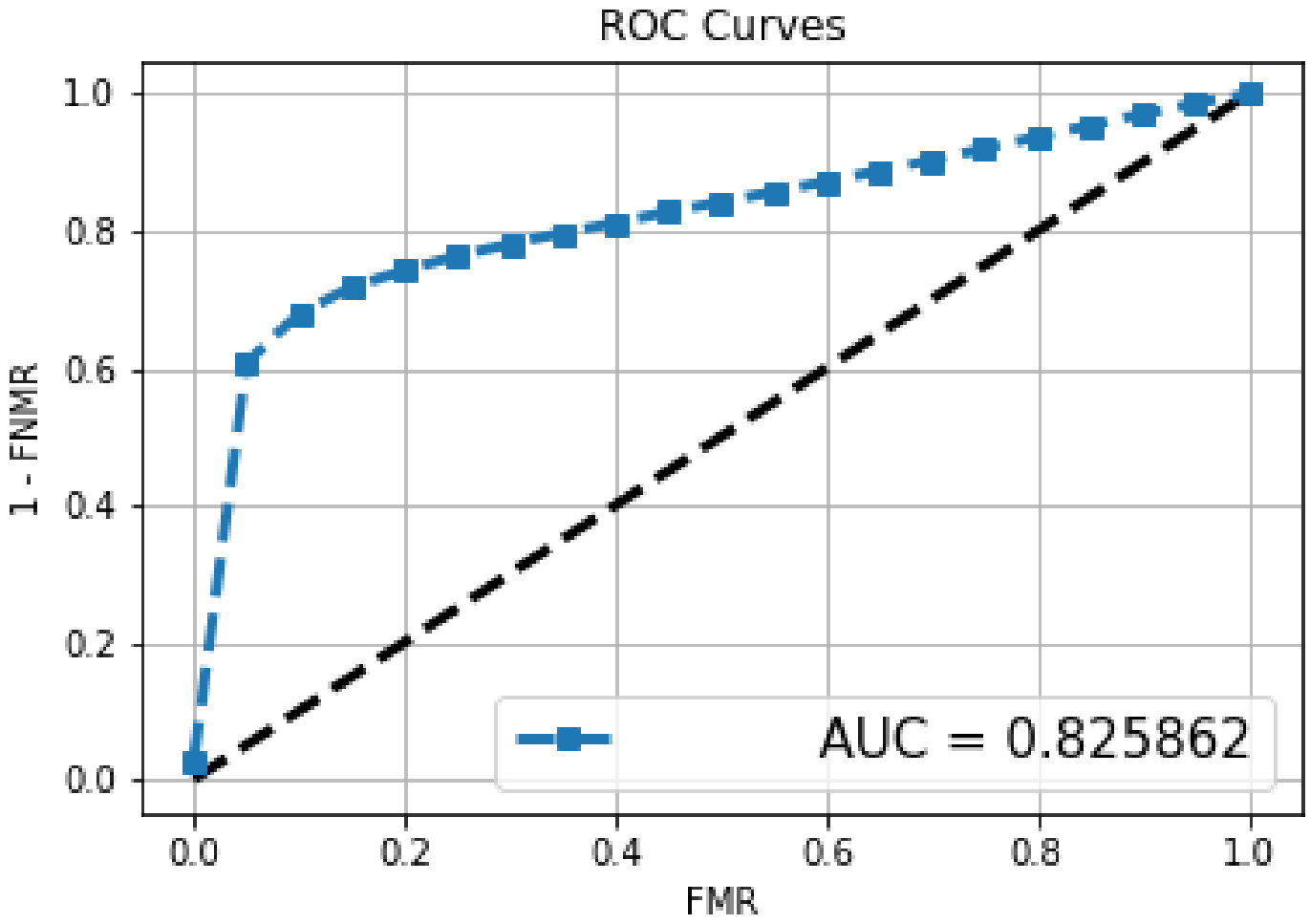
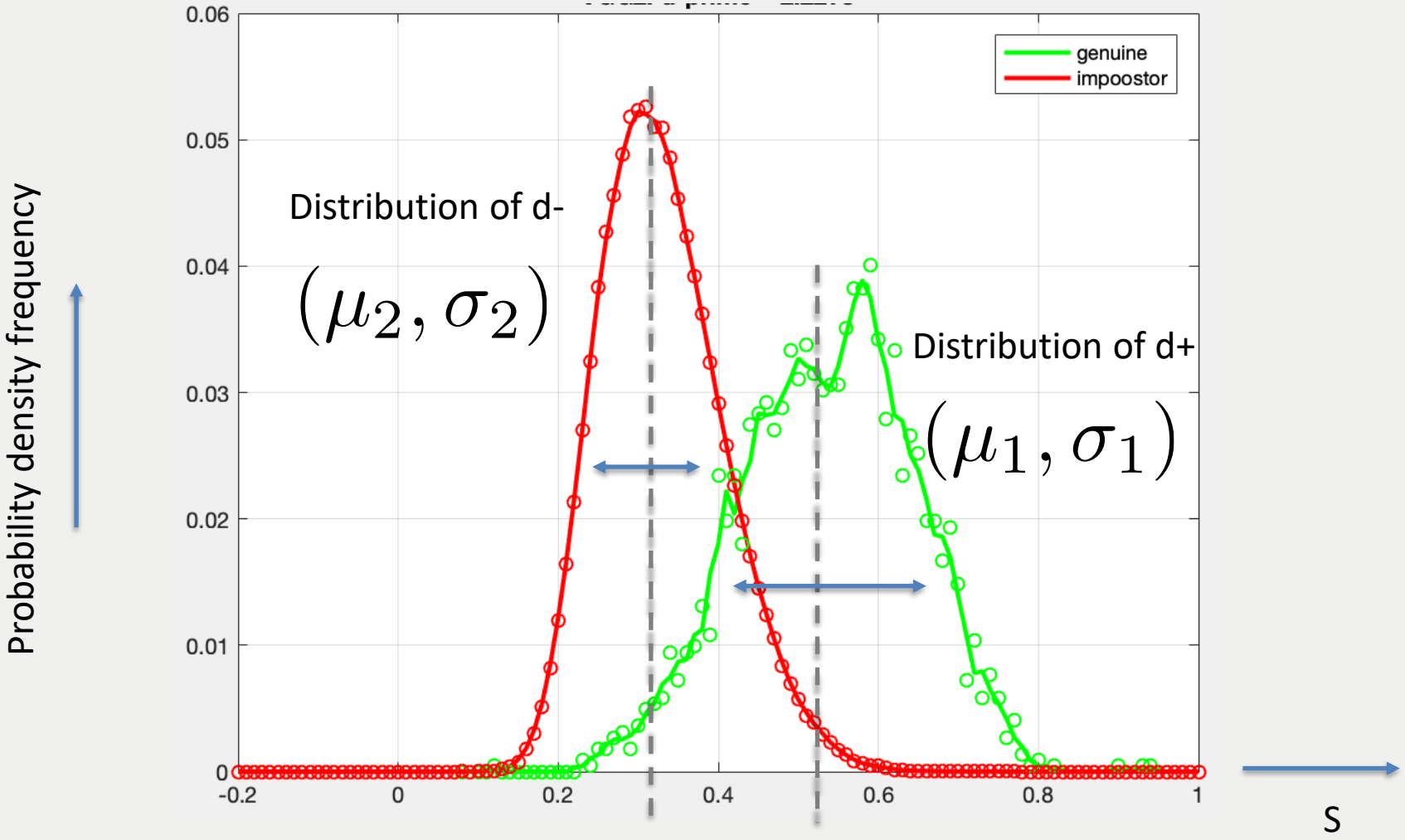

FMR and FNMR Curves
1.0
0.8
0.6
0.4
0.2
0.0
Error
(FMR)
(FNMR)
-0.2
0
0.2
0.4
0.6
0.8
1
Matching Scores


ROC Curves
1.0
0.8
0.6
0.4
0.2
0.0
1 - FNMR
0.0
0.2
0.4
0.6
0.8
1.0
FMR
AUC = 0.825862

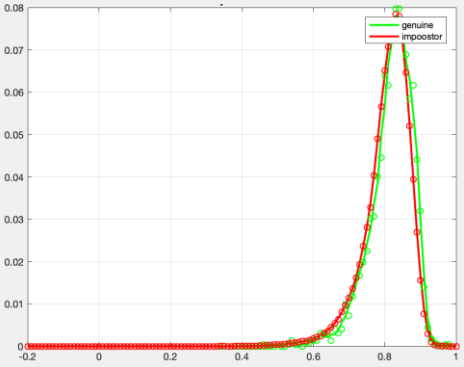


Performance:

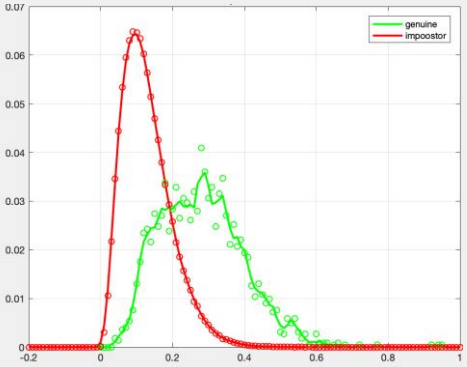
$$d' = \frac{|\mu_1 - \mu_2|}{\sqrt{\frac{1}{2}(\sigma_1^2 + \sigma_2^2)}}$$

Area of each distribution = 1

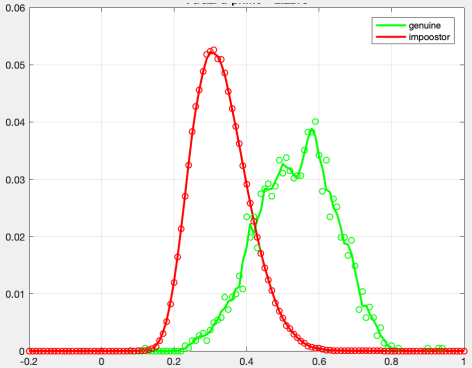
Examples of d’
for different algorithms



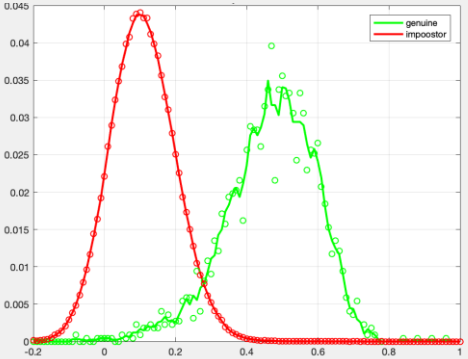
d’ = 0.20



d’ = 1.59



d’ = 2.22



d’ = 3.23

The best one